Experimental Bronchography by Tantalum Insufflation*

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Experimental bronchography with heavy metal tantalum was performed in ten greyhound dogs. The method is simple, produces excellent bronchographic pictures and does not produce pathologic changes.

Since the introduction of bronchography by Jackson in 1918, attempts have been made to find a contrast material which would possess the characteristics of the ideal bronchographic medium. These are: (a) the production of good radiographic contrast and mucosal detail; (b) prompt elimination from the tracheobronchial tree; (c) no alveolar filling; (d) no untoward reaction during or after bronchography; (e) no interference with pulmonary function, and (f) simplicity in its introduction to the tracheobronchial tree.

After the first attempt by Jackson in which bismuth powder was used as the contrast medium, Lynah and Stewart were able to demonstrate lung abscess from bismuth suspension in oil introduced through a bronchoscope. In 1927, Sicard and Forestier introduced the safe use of iodized poppyseed oil (Lipiodol), and bronchography became a routine technique. With the advent of modern thoracic surgery, bronchography has become increasingly important as a valuable aid in precise localization of pathologic changes in the bronchial tree.

The iodized contrast material used at present, however, does not possess all of the characteristics as stated above so that many chest physicians, thoracic surgeons and radiologists have adopted a skeptical attitude toward bronchography as a routine procedure.

Nadel and Wolfe, returning to Jackson's original concept of insufflating a high contrast, non-absorbable material for bronchography, used metallic gold and tantalum in dogs and humans and were able to produce excellent bronchograms without the drawbacks of the iodide substances. They demonstrated through radiologic study that these metals were

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References
one week and one month after bronchography and histologic examination of the excised lungs was performed.

**RESULTS**

Figure 1 shows tantalum bronchograms in dog 1. Prominent characteristics are the lack of alveolarization in spite of filling of distal bronchioles and good mucosal detail. Figure 2 depicts the radiograph taken 12 hours after bronchography. As can be seen, only minimal amounts of tantalum remained in the right lower lobe close to the heart. In all the dogs, no contrast material was visualized radiographically after 24 hours.

Figure 3 shows a histologic section from the lower lobe of an animal sacrificed immediately after the bronchogram. Tantalum particles can be seen clearly in the lumen of a secondary bronchus as dark geometric spots.

Figure 4 is a histologic section of the lung from dog 3 sacrificed 24 hours after bronchography. No tantalum was found in a survey of multiple sections made. No inflammatory changes were demon-

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**FIGURE 1.** Posteroanterior bronchogram. Notice filling of distal airways and absence of alveolarization.

The purpose of this study is to further document results of tantalum insufflation in experimental subjects.

**MATERIAL AND METHODS**

Tantalum* is gray-black colored heavy metal with an atomic weight of 180. Its atomic number is 73 and has a specific gravity of 16.6. Tantalum has been used extensively in medicine as part of prostheses and to assist in healing of wounds.2

Ten greyhound dogs weighing between 40 and 60 pounds were anesthetized with sodium pentobarbital, 50 mg/kg, and intubated with an endotracheal tube. This was connected to a Bennett PR-1 respirator at a pressure of 12 to 15 cm H2O, and metallic tantalum was introduced in the nebulizer of the respirator in amounts of 0.5 mg/kg. The tantalum was nebulized for 20 to 50 breaths or until the bronchial tree could be visualized with fluoroscopy. Posteroanterior, lateral and oblique films of the chest were obtained before and immediately after tantalum inhalation and also before the animal was sacrificed.

Animals were sacrificed on the same day, 24 hours,

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**FIGURE 2.** Radiograph taken 12 hours after bronchogram. Only minimal amounts of tantalum remain at the level of the right cardiophrenic angle.
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qualities of the ideal bronchographic agent described in the introduction. It is promptly eliminated within eight hours of its introduction to the bronchial tree. Satisfactory bronchial mucosal detail without alveolarization or deleterious histologic effects in the experimental animal have been demonstrated. It appears that tantalum possesses excellent potential as a bronchographic medium for clinical usage.

It is obvious that the additional disadvantage of iodide preparations with respect to subsequent thyroid studies is eliminated with the use of this medium.

With the method of tantalum administration described above, satisfactory filling of the bronchi only in the lower lung fields could be demonstrated. Further studies with different methods of administration are in progress, both in the experimental subject and in patients.

REFERENCES

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Fatal Hemoptysis in Mitral Stenosis*

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Fatal massive hemoptysis is described in a patient with moderate mitral stenosis treated supportively. Hemodynamic studies and postmortem examination supported bronchial vein anastomoses as the source of hemorrhage. Review of previous reports emphasizes the necessity of prompt surgical intervention in this syndrome.

Although hemoptysis is a common symptom of mitral stenosis, it is rarely life-threatening. Occasional cases of fatal hemoptysis have been reported, and in recent years emergency mitral valve surgery has proved to be effective therapy. A case

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